No. XXIII

Continuation of Astronomical Observations, made at Lancaster, Pennsylvania. In a letter from Andrew Ellicott, Esq. to R. Patterson.

Read Oct. 7th, 1803.

Lancaster Oct. 1st, 1803.

DEAR SIR,

I now forward a continuation of my astronomical observations, made at this place: they would have been more numerous had the weather permitted. The season has been remarkably unfavourable for such pursuits.

The results of the observations on the solar eclipse of the 21st of February, the occultations the 30th of March, 27th of May, and 23d of September last, I have not as yet had time to make out:—the duties of my office admitting of but little leisure for scientific enquiries.—But to the observations.

Feb. 21st, 1803. Observations on the beginning of a solar eclipse.

The day was cloudy till about half an hour before the beginning of the eclipse; on which account I had made no preparations to observe it.—A few minutes before the time calculated for the beginning, I directed the telescope to the sun; the lower limb was very tremulous, and indented in many places by a waving, serpentine motion, which will frequently be observed when the sun is near the horizon:—these indents, combined with other causes, produced an uncertainty of a few seconds, (though probably not more than 10 or 12) in the beginning, which I observed at $5^h\ 4'\ 57''$ mean time, or $4^h\ 50'\ 57''$ apparent time.

23d. Took the pendulum with the wooden rod from my clock, and substituted a grid-iron one, which I had that day completed.

March 1st. Immersion of the 1st satellite of Jupiter, observed at $8^h\ 31'\ 13''$ mean time, or $8^h\ 18'\ 31''$ apparent time. The planet tremulous, and the belts indistinct:—magnifying power 100. At 9 o'clock in the evening the thermometer stood at 6°.

11th. Immersion of the 2d satellite of Jupiter, observed at $10^h\ 43'\ 35''$ mean time, or $10^h\ 33'\ 18''$ apparent time:—night remarkably fine:—magnifying power 100.

19th. Immersion of the 3d satellite of Jupiter, observed at $9^h\ 18'\ 39''$ mean time, or $9^h\ 10'\ 38''$ apparent time.—The evening hazy; on which account, I think, that at least 30″ ought to be added to the observed time of the immersion; which I shall therefore do in comparing the result of this observation with those of the other satellites:—magnifying power 100.

29th. Emersion of the 2d satellite of Jupiter, observed at $7^h\ 48'\ 16''$ mean time, or $7^h\ 43'\ 18''$ apparent time:—the planet and satellites well defined, and very steady:—magnifying power 100.

30th. Observations on the occultation of ϰ ♊ by the moon.

	h ′ ″		h ′ ″
Immersion at	8 25 8	mean time, or	8 20 29 apparent time.
Emersion at	9 45 14		9 40 36

The above time of the emersion may possibly be 5 or 6 seconds too late;—not having my attention directed to the precise spot where the moon's limb left the star; but, when I discovered it, the light of the star and the moon's limb appeared to be nearly in contact. It is however to be observed, that when the emersions happen on the moon's enlightened limb, the observations may generally be considered doubtful, a few seconds*.

* Lorsque la lune a passé l'opposition, sa partie orientale est éclaireé, sa partie occidentale est obscure; ainsi les immersions se font dans la partie éclaireé, et les émersions se font dans la partie obsure; c' est-a-dire, á gauche, dans une lunette astronomique—Je crois que ce sont lá les seules

April 5th. Emersion of the 2d satellite of Jupiter, observed at $10^h\ 23'\ 29''$ mean time, or $10^h\ 20'\ 41''$ apparent time:—night very clear and the belts distinct:—magnifying power 100.

9th. Emersion of the 1st satellite of Jupiter, observed at $9^h\ 9'\ 59''$ mean time, or $9^h\ 8'\ 20''$ apparent time:—night clear, and belts distinct:—magnifying power 100.

22d. Immersion of the 4th satellite of Jupiter, observed at $12^h\ 41'\ 19''$ mean time, or $12^h\ 42'\ 54''$ apparent time. At the time this observation was made, the night was very serene and clear:—four belts were distinctly defined on the body of the planet:—magnifying power 100.

Emersion of the above satellite was observed at $14^h\ 52'\ 34''$ mean time, or $14^h\ 54'\ 10''$ apparent time.—The night had become a little hazy, and the belts were scarcely discernable.—The satellite appeared for a few seconds, and then became invisible for more than a minute. From the state of the atmosphere, and the slow manner in which the satellite acquired its light, owing to its oblique way through the shadow of Jupiter, it is my opinion, that at least 2 minutes should be deducted from the observed time of the emersion; which deduction I shall accordingly use in making out the result of the observation.

May 2d. Emersion of the 1st satellite of Jupiter, observed at $9^h\ 21'\ 34''$ mean time, or $9^h\ 24'\ 46''$ apparent time:—night clear, and belts distinct:—magnifying power 100.

9th. Emersion of the 4th satellite of Jupiter, observed at $8^h\ 39'\ 28''$ mean time, or $8^h\ 43'\ 17''$ apparent time.—The planet and satellites were well defined, and the observation one of the most satisfactory I have made at this place:—magnifying power 100.

Emersion of the 1st satellite of Jupiter, observed at $11^h\ 15'\ 46''$ mean time, or $11^h\ 19'\ 35''$ apparent time. This evening I began to pay attention to the decrease of Saturn's ring.

émersions dont on puisse être bien assuré; car quand l' etoile sort de la partie é claireé de la lune, sa lumiere, trop foible par rapport á celle de la lune, ne se distingue pas facilement au premier instant de l' émersion.

Astronomie par la Lande art. 1990.

11th. Saturn's ring well defined; the ansæ are evidently diminishing:—two satellites visible.

14th. Emersion of the 2d satellite of Jupiter, observed at $12^h\ 41'\ 54''$ mean time, or $12^h\ 45'\ 52''$ apparent time:—night clear:—magnifying power 100.

16th. Saturn's ring well defined:—the ansæ not perceptibly diminished since the 11th.

27th. Occultation of a star, supposed to be ε Leonis (♌) observed at $8^h\ 17'\ 53''$ mean time, or $8^h\ 21'\ 10''$ apparent time.

Saturn's ring well defined:—the ansæ decreasing, and appear more luminous towards their extremities than near the body of Jupiter: two satellites very distinct.

June 6th. The night very clear and fine; Saturn's ring was particularly attended to: the ansæ appeared more luminous and sparkling toward their extremities, than near the body of the planet:—three satellites were visible.

9th. Saturn's ring yet visible:—the ansæ were distinct during the twilight, but faint afterwards.

13th. Immersion of the 3d satellite of Jupiter, observed at $9^h\ 7'\ 56''$ mean time, or $9^h\ 8'\ 25''$ apparent time:—the planet and satellites tolerably distinct;—magnifying power 100.

15th. Saturn's ring decreasing: the ansæ were scarcely descernable after the end of twilight.

17th. Emersion of the 1st satellite of Jupiter, observed at $9^h\ 45'\ 43''$ mean time, or $9^h\ 45'\ 21''$ apparent time.—The night clear, and the planet and satellites well defined:—magnifying power 100.

Saturn's ring very faint:—the ansæ were invisible after the end of twilight.

18th. Saturn's ring more faint than last evening: the ansæ disappeared before the end of twilight.

21st. Saturn's ring almost invisible:—the ansæ would frequently disappear for whole minutes, and then become visible for a few minutes more.

22d. The ring of Saturn has almost disappeared: the western ansa only visible, and that for but a few seconds at a time.

23d. The ring of Saturn invisible, though I looked for it with both telescopes* during the twilight, and half an hour after. By the theory of Mr. Sejour, the disappearance of the ring ought to have taken place on the 28th†; and, perhaps, with better telescopes, that would have been the case; for much depends upon the goodness of those instruments, and the state of the atmosphere at the time of making the observations.—With Mr. Herschel's large telescope there is no real disappearance. It is likewise possible, that the difference between the disappearance as resulting from the theory, and observation, may, in part, be owing to a small retrogade motion in the nodes of the ring.

Sept. 23d. The moon occulted a star at $8^h\ 43'\ 51''$ mean time, or $8^h\ 51'\ 28''$ apparent time. The star is in the constellation of Sagittarius ($\sharp$), and supposed to be the one numbered 712 in Mayer's catalogue:—it is of the 6th magnitude: the star appeared to remain well defined 4 or 5 seconds on the moon's limb, but the disappearance was instantaneous.

I shall now, after a preliminary observation, proceed to state the results of the foregoing observations on the eclipses of Jupiter's satellites, as deduced both from Mr. Delambre's tables, and the British nautical almanac.—As a standard of comparison I shall consider the correct longitude of Lancaster to be $5^h\ 5'\ 4''$ west, from the observatory at Greenwich; and which I am persuaded will not be found many seconds erroneous‡.

	Long. by Delambre's tables.	Long. by the naut. almanac.
	h ′ ″	h ′ ″
1803, March 1st. Immer. 1st sat.	5 5 21	5 5 58
too great.	17	too great. 54
11th. Immer. 2d sat.	5 4 43	5 6 28
too small.	21	too great. 1 24

* One of them a Reflector with a magnifying power of 300.

† Essai sur les phénomènes relatifs aux disparitions périodiques de l' anneau de Saturn. Par *M. Dionis Du Séjour*. Pages 165 & 166.

‡ NOTE. Agreeably to the tables of Mr. Delambre, the longitude of Lancaster, by a mean of the five observations on the eclipses of the 1st satellite of Jupiter, appears to be 5h 5′ 10″ west from Greenwich; which exceeds the assumed standard 6″:—And if a mean of all the determinations, agreeably to the same tables, be taken collectively, the longitude will be 5h 5′ 4″ west from Greenwich, which agrees exactly with the assumed standard.

	h / //		h / //
19th. Immer. 3d sat.	5 5 27		5 13 55
too great.	23	too great.	8 51
29th. Emer. 2d sat.	5 5 20		5 5 42
too great.	16	too great.	38
April 5th. Emer. 2d sat.	5 5 22		5 5 40
too great.	18	too great.	36
9th. Emer. 1st sat.	5 5 4		5 5 40
too great.	0	too great.	36
22d. Immer. 4th sat*.	5 3 28		4 44 30
too small.	1 36	too small.	20 34
do. Emer. do.	5 4 16		5 6 55
too small.	48	too great.	1 51
May 2d. Emer. 1st sat.	5 5 1		5 5 38
too small.	3	too great.	34
9th. Emer. 4th sat.	5 6 26		5 11 23
too great.	1 22	too great.	6 19
do. 1st sat.	5 5 16		5 6 4
too great.	12	too great.	1 0
14th. Emer. 2d sat.	5 5 30		5 5 38
too great.	26	too great.	34
June 13th. Immer. 3d sat.	5 4 41		5 13 1
too small.	23	too great.	7 57
17th. Emer. 1st sat.	5 5 9		5 5 58
too great.	5	too great.	54

On the 23d of February the pendulum with a wooden rod was taken from the clock and replaced by a grid-iron one; but, owing to the unfavourable situation of the clock, I did not expect to derive any material advantage from the change; in this however I have been agreeably disappointed; the extreme variations from the mean rate of going for the whole year, will not amount to 2 seconds, notwithstanding the con-

* The theory of the 4th satelllte of Jupiter is a subject of peculiar nicety, and has required great labour to bring it to its present degree of perfection; for which we are principally indebted to the genius, and industry of Mr. Delambre. An error so small in the inclination of the orbit of this planet, or in the place of the nodes, as to be scarcely distinguished from the unavoidable errors of observation, when the satellite passes through the center of Jupiter's shadow, will become very considerable as it is leaving it at either pole; because, those errors increase nearly in the ratio of the squares of the satellite's distances from the center of the shadow. From the immersion, and emersion of April 22d, to which this note refers, it appears, that the inclination of the orbit of this satellite, is either stated too small in the theory used by the computers of the British nautical almanac, or is subject to changes not yet introduced into these tables.

stant jaring of the building by the shutting of the doors belonging to it.

I am, Sir, with great esteem,

your friend and humble servant,

ANDREW ELLICOTT.

Mr. Robert Patterson,
V. P. of the A. P. S.

No. XXIV.

Observations and Experiments relating to equivocal, or spontaneous, Generation. By J. Priestley, L. L. D. F. R. S.

Read, Nov. 18th, 1803.

THERE is nothing in modern philosophy that appears to me so extraordinary, as the revival of what has long been considered as the exploded doctrine of *equivocal*, or, as Dr. Darwin calls it, *spontaneous generation**; by which is meant the production of organized bodies from substances that have no organization, as plants and animals from no pre-existing germs of the same kinds, plants without seeds, and animals without sexual intercourse.

The germ of an organized body, the seed of a plant, or the embrio of an animal, in its first discoverable state, is now

* Thus the tall oak, the giant of the wood,
Which bears Britannia's thunders on the flood;
The whale, unmeasured monster of the main,
The lordly lion, monarch of the plain,
The eagle soaring in the realms of air,
Whose eye undazzled drinks the solar glare,
Imperious man, who rules the bestial crowd,
Of language, reason, and reflection proud,
With brow erect who scorns this earthly sod,
And styles himself the image of his God;
Arose from rudiments of form and sense,
An embrion point, or microscopic ens!!!
Temple of Nature.